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# **SUPPORTTING TEACHERS INTEGRATING WEB 2.0 IN A PROBLEM BASED LEARNING APPROACH**

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## **Abstract**

This article try to illustrate a design model or method supporting teachers in their learning design trying to integrate web 2.0 technologies into the Problem Based Learning (PBL) approach at Aalborg University (AAU).

Taking departure in PBL as a theoretical approach for learning and with a focus on participant control and a more learner-centred approach as used at AAU, I will argue that it makes good sense to connect web 2.0 with a problem-based approach to learning. There seems to be a transition from 'users/learners as consumers' towards 'users/learners as producers', which also vey well relate to the problem-based learning approach as to be elaborated.

At AAU we have further developed the PBL approach Problem oriented project based learning (POPBL) under inspiration of PBL. It was implemented as a framework for learning when Aalborg University was established in the beginning of the 1970's. Due to the possibilities in using web 2.0 applications or services it makes it interesting to look upon a learning design model supporting teachers at AAU in their pedagogical design combining the PBL approach and web 2.0.

A question then arise; "How can we support the teachers in making a "new" learning design combining PBL and web 2.0?"

I have chosen to get inspiration from The Collaborative E-learning Design (CoED) method. The method supports the design process of practitioners and has been developed and tried out in a number of different settings. Drawing on knowledge and theoretical concepts within the fields of design, systems development and collaborative learning, emphasis is on bringing focus and structure to the early stages of the design process. Further the method aims to develop design specifications and/or early prototypes within few hours of work, and as of importance to support the collaboration between different types of experts and practitioners.

I hope that further developing this method will lead to a pedagogical design method supporting teacher in their design for learning taking into account the PBL approach and integration of web 2.0-technologies, which is to be tried out at the Faculty of Social Science during autumn 2010.

Keywords: Problem Based Learning, web 2.0, design, teaching, technology, CoED,

## **1 INTRODUCING PROBLEM BASED LEARNING**

Problem-Based Learning (PBL) has gained a lot of interest since it was launched in established educational settings over 30 years ago in the medical programmes at McMaster University, Canada. Essentially it is a leaning method based on the principle of using problems as a starting point for learning and it is used in multiple disciplines. There are many descriptions and definition of PBL and diving into different definitions it seems that PBL-practices are quite complex:

"As even superficial inspection of a few of the available sources can reveal, the label 'PBL' is used to cover an amazing diversity of educational practices, ranging from problem-oriented lectures to completely open experiential learning environments aimed at improving interpersonal relations." [1]

"The term problem-based learning must be considered a genus for which there are many species and subspecies. Each addresses different objectives to varying degrees. All description and evaluation of any PBL method must be analysed in terms of the type of problem used, the teaching learning sequences, the responsibility given to students for learning and the student assessment method used." [2]

Barrows (1986) proposes three variables that can be used to differ between various PBL-practices. The first is about the design and format of the problem: is the problem given to the students or self-chosen, and how open is the problem. Are students given detailed description of the problem along with references to how to solve the problem, or is the problem more ill-defined and entail free enquiry. Secondly, he differs between whether the learning process is teacher directed or learner directed e.g. whether the *teacher determines the amount of information and the sequence of information to be learned in the domain of a course* [2] or whether this responsibility is delegated to students and tutors. The third variable concerns, the sequence in which problems are given and information acquired e.g. are cases/problems provided before or after further information is presented. Based on these dimensions, Barrows (1986) identifies different PBL-practices such as, lecture-based cases, case-based lectures, problem based and closed-loop problem based approaches and discuss their ability to support:

1. The structuring of knowledge in relation to actual practices (learning in the context of a practice)
2. Development of effective reasoning skills
3. Development of effective self-directed learning skills
4. Increased motivation for learning (in relation to which Barrows argue that higher degrees of freedom and self-control also entail higher motivation).

In this sense the intended learning outcomes of PBL and the ideas of students as more active, productive and engaged in real practices seem to correspond well with the ideas and ideals often associated with web 2.0. For example those identified by Crook & Harrison (2008) where students gain more control and engage in enquiry, collaboration and publication, which support more diverse literacies [3]

While Barrows is particularly interested in discussing different PBL approaches within clinical, medical practice the variables and the four outcomes or learning objectives of PBL are more broadly applicable, and are also highlighted by others. Although there are differences and various interpretation of PBL, one can also find some general traits, for example several authors argue that problems are the starting point for the learning process [4], [1], [5], [6]. In line with Barrows these authors argue that important aspects are: The design of the problem, who formulates the problem and who is responsible for the major decisions in relation to the problem solving process (teacher or participant directed). Also they highlight the importance of experience learning, where students build on their own experiences, and the notion of learning through active engagement in actual practices or real-world problems involving research activities, decision-making and writing. In addition, some stress the principle of inter-disciplinarity, which is related to the principles of problem orientation, and participant directed processes, as the solution of problems can exceed traditional subject-related methods and boundaries. They equally argue that group work and collaboration is an important principle (though some argue that PBL can be more individualised), but they also point to differences in the understanding of collaboration, and the way in which students are mutually interdependent.

At Aalborg University we operate with the term in relation to what we call "the Aalborg PBL model" [7]. This model has its historical roots in critical theory and, in particular, in the work of the German philosopher and sociologist Oskar Negt. Negt's work gained a lot of interest in Denmark and the Problem oriented project based learning (POPBL) was developed under this inspiration. It was implemented both at Roskilde University Center (RUC) and Aalborg University as a framework for learning when these two universities were established in the beginning of the 1970's. The study form has also proved to work well, offering high rates of accomplishment at a satisfying level of qualification both in psychical and online setting [4], [7]

The PBL approach in "The Aalborg Model" is also distinguished from the more traditional understanding of PBL on some foundational principles. The foundational principles within the POPBL are building on meaning negotiation in relation to explicit a problem formulation and the enquiry of problems within the theme of a semester. The semester is lasting half a year (5 months approx.), and each semester has defined a theme or a frame as part of the semester plan, in which field both courses and the project work is to be placed. In a semester the course work refers to 50% and the project work refers to the last 50%. Further the courses are divided into project related courses, which gets assessed or evaluated in the final project exam and study courses which is based on individual exams. The project work and defining a problem is built on the students' curiosity and wanting to find answers to the problem formulated. The curiosity of the students and the wonder is important,

because it contribute towards a high degree of ownership and engagement in the learning process together with what you might call student control (or learner self navigation). In the POPP approach the students has a reciprocally binding in defining a problem and do research in the field of the problem ending with a mutual responsibility for prepare a final report accounting for the findings. Taken from this perspective POPP is to be seen as a very learner active and collaborative pedagogy, which requires interdependency between participants in the learning situation, together with motivation, support and facilitation from the teachers point in the learning process. [8], [7].

Although the problem oriented project organised leaning approach has been successful at Aalborg and as mentioned above has proved to work well, offering high rates of accomplishment at a satisfying level of qualification, there are also reservations about the fully use of this approach. It's important to support teachers in design of learning or redesign of learning practice.

## 2 WEB 2.0 AND LEARNING

Looking at the PBL makes it interesting also to look at web 2.0 and I would like to begin by defining web 2.0 and learning in order to identify the cross field between the two. Crook et al. (2008) mention different reasons why web 2.0 technologies could potentially benefit current teaching practices in a BECTA report. Firstly, young people are already using web 2.0 technologies in different settings, which mostly is private so far. Secondly, web 2.0 activities are understood to be important from a learning theoretical perspective [9]. Particularly qualities such as the centrality of participation, production, dialogue, and collaboration make web 2.0 activities ideal to actively engage learners individually as well as collaboratively. Thirdly, there is a match between current policy and curriculum goals where terms, such as enterprise 2.0 reflects that web 2.0 technologies are also important in the modern economy [9]. Finally, the user-centred focus of web 2.0 activities supports the users in creating and maintaining connections between formal as well as informal learning arenas [10].

But how do we actually define web 2.0? While a multitude of partly overlapping definitions of web 2.0 exist we have identified two more overarching perspectives or ways of understanding web 2.0, and ways in which it has been practiced e.g. Anderson defines web 2.0 as:

(...) a group of technologies which have become deeply associated with the term: blogs, wikis, podcasts, RSS feeds etc., which facilitate a more socially connected web where everyone is able to add to and edit the information space. [11]

From this definition web 2.0 is understood as a set of technologies, but also as a range of activities with certain characteristics. In this way we can distinguish between web 2.0 *technologies* or *resources* as e.g. blogs, microblogs and podcasts and then web 2.0 *activities* or practices such as blogging, podcasting, and micro-blogging. This distinction has been further explored by Dohn (2009) who has defined web 2.0 as a range of activities or practices, rather than technologies, which she characterises in the following way [10]: 1) collaboration and/or distributed authorship, 2) active, open-access, "bottom-up" participation and interactive multi-way communication, 3) continuous production, reproduction, and transformation of material in use and reuse across contexts, 4) openness of content, renunciation of copyright, distributed ownership, 5) lack of finality, "awareness in practice" of the "open-endedness" of the activity, 6) taking place on WWW, or to a large extent utilizing web-mediated resources and activities.

With the distinction between technology and activity I want to emphasise that using e.g. a blog as a *technology* or *resource* in teaching does not necessarily make it a web 2.0 *activity*. Rather this involves engagement with the practices or values mentioned above, and thus entails more than merely employing a particular technology. However, I agree with Dohn that 'a web 2.0 activity' is a matter of degree, meaning that an activity does not have to be characterized by all of the points on the list above (except the last one which Dohn argues is a necessary condition [10]).

Overall, one might say that the shift from web 1.0 to web 2.0 within an educational context can be characterized as a shift in participant control in relation to different aspects of the learning activities. Curriculum based strategies, normally designated as *teaching*, aim at providing the student with a relatively fixed amount of agreed upon knowledge, and with a focus on content, teacher control and instruction. Problem-based strategies normally designated as *learning*, on the other hand aim at providing the student with abilities to acquire knowledge appropriate to problem solving. In Problem-Based Learning (PBL) the focus is on participant control [12], which also means that a transition from curriculum-based teaching to PBL entails a movement from a teacher-centred approach to a learner-centred approach [13], [14]. From this point of view, one might say that this move in many ways could

be compared to the conceptual move from web 1.0 to web 2.0, and again this by some is seen as a transition from 'users/learners as consumers' towards 'users/learners as producers' [15]. Related to this I might add, that within learning research there seems to have been a gradual move from what you could call learning 1.0 seen as a more traditional curriculum-based approach towards learning 2.0 as a more problem-based approach to learning, but again it should be noted that actual pedagogical practice or institutionalised education has not necessarily changed to the same degree, and there are some issues like electronically assessment, degree of participant control educational organisations need to addressed towards the implementation of social media and web 2.0 mediated learning. Conole (2007) identifies this transition as part of three broader shifts, which are related to an emerging interest in the social potentials of technologies, partly due to the emergence of web 2.0 technologies: In essence, this suggests that there are three fundamental shifts: a shift from a focus on information to communication, a shift from a passive to more interactive engagement, and a shift from a focus on individual learners to more socially situative learning. [16]

Dealing with a practice perspective on web 2.0, Dohn stresses that it is not technology in itself, which is important but the skill-relative affordances it poses for the learner. In relation to this it is important to note that skills and affordances develop from the skills the learner has and the practices s/he is already engaged in, and the understandings of which s/he agrees with [10]. Consequently, to design web 2.0 mediated learning Dohn argues that one should build on existing practices and skills and make them more web 2.0 oriented [10]. However there are some tension fields between the educational practice and a web 2.0 practice at different organizational levels, which also is important to address. In an educational practice it's expected that everybody contribute equally in e.g. group work but in a web 2.0 practice there is an unequal division of labor, and it's possible to be what one could call a "free rider". At AAU where collaborative group work is an important factor in the pedagogical approach this issue could be of importance to address in a learning design based on web 2.0 technologies. Another tension is assessment whereas there is teacher and examiner represented for assess, but in a web 2.0 practice it ought to be the users themselves. It's an interesting thought, but so far not really realistic in the educational practice. Further we need to decide on the parameters assess upon e.g. product vs. process or participation vs. content, however it might be possible to assess upon both, but it's importance to be clear about this to the learners.

Crook et al. (2008) argue we should build research on documented exchanges in learning situations [9]. However, case studies in relation to adopting web 2.0 resources or technologies are seldom evaluated in relation to their impact on learning (Ibid.). In a review of existing research Conole et al. (2008) conclude that students are actively involved in co-designing their e-learning environment [17], but also state that little in-depth research has been done on how students use technologies to support their learning [17] – this might also be related to the fact that actual adoption of web 2.0 learning practices are relatively infrequent [18]. Therefore, to find more consistent and well-established patterns in the use of and experience with web 2.0 oriented learning more analyses are needed, and there is a need for supporting teachers into looking at their practice from a web 2.0 mediated learning approach.

## **2.1 Combining PBL and web 2.0 – web 2.0 mediated learning**

Problem-based learning is a student-centred pedagogy focusing on students' active and often collaborative production of knowledge through engaging with real world problems/cases. Although there are differences in how PBL is carried out in practice, one can also find some general traits; i.e. that problems are the starting point for the learning process; that students should build on their own experiences and learn through active engagement with real-world problems/cases, which involve research and empirical activities often in collaboration with peers. Numerous PBL scenarios may be developed for different settings. However, the central aspect is how power is distributed between teachers and students across three dimensions: the *problem*, the *work process*, and the *solution*. Reflecting on these different aspects can support teachers/course-designers in developing PBL practices, which are congruent with new learning practices and institutional demands.

Some of the core concepts associated with web 2.0, such as collaboration, participation and sharing, are well aligned with PBL. As stressed earlier I find it useful to distinguish between web 2.0 as a range of technologies (e.g. blogs, podcasts, wikis) and web 2.0 as particular practices or activities (e.g. blogging, podcasting, collaborative writing). This distinction is emphasised because employing a web 2.0 *technology* does not necessarily entail pedagogically innovative web 2.0 *practices*. For example, a teacher may create a blog and then use it only to disseminate information to students, not allowing them to write or comment. Therefore, web 2.0 learning is not only about using particular technologies,

but equally about the degree to which teachers adopt more student-centred, participatory or collaborative practices.

Consequently, it makes good sense to connect web 2.0 with a problem-based approach to learning, but at the same time, new tensions and challenges arise. Particularly questions concerning power distribution between students and teachers become pertinent when combining student-centred pedagogies and web 2.0 learning practices. Glud et. al (2010) has done some research within web 2.0 mediated learning and mapped such tensions across four central dimensions, which practitioners can use to reflect on their design and values - see fig.1:



Fig. 1: Web2.0 learning tensions between teacher and learner

Taking these four dimensions into consideration can provoke questions in relation to who controls the flow in the learning process, e.g. should students be self-directed learners, who defines the problem to be investigated, who decides which web 2.0 tools/practices to use, how about copyrights in a web 2.0 sphere, etc.? When adopting student-centred pedagogies and web 2.0 practices it is increasingly important to reflect and decide on such issues of control or power. These aspects are more often employed in informal learning settings, in intra-organisational training or for purely social purposes. I believe that questions similar to the before mentioned are to be addressed when designing web 2.0 learning environments; and different answers may be given depending on the different learning settings and goals.

### 3 THE COLLABORATIVE E-LEARNING DESIGN METHOD (COED)

Dealing with the issues of PBL and web 2.0 together with control and power I will draw on a design methodology called “Collaborative E-learning Design Method” (CoED), which is developed during a project called Learn@Work [19]. The design methodology has been developed, used, evaluated and further developed in a variety of educational, institutional and organisational contexts. In this paper I would like to further elaborate on it.

CoED is a common methodological framework developed with input from research on:

- *Systems development* – because we design (for) information and communication technology
- *Collaborative learning* – because we design for learning and learn in the design process
- *Facilitating creative processes* – because the aim is to develop something new

Before elaborating on the method I would like to go into greater detail with the teoretical background for the method and how the contributions from the three domains contribute to the method.

#### 3.1.1 Systems development and design

Within systems development and design several development paradigms can be identified and only a few offer relevant contributions to the design of learning activities today. Traditionally the focus of systems development has been on management of development projects by means of linear processes organising system engineering from idea and system requirements to system design, programming and technical test (the so-called waterfall model) [20]. This approach is often criticised because of its' straight-line linear process focusing on designing a technical system, thus producing tangible designs only at the very end of the project [21], [22], [23]. The same sources also stress that development of information and communication technology (ICT) normally involves more than a technical system; namely social systems which influence and are influenced by the technical system. From this one can draw the assumption that a systems development method must facilitate a learning process which involves both designers and future users in a short cycle iterative development which continuously produces designs that can be tested with users. Some stress that possible future practices with a new system can be subjected to discussion involving designers and users even

before the very first prototype. This is done by the use of scenario based narratives, forecasting the future with a new system [24].

### 3.1.2 Collaborative learning in design teams

The systems development domain has already drawn attention to the fact that specification and design can be regarded as a learning process in a community of learners learning together. According to Wenger, a social theory of learning must include community, practice, meaning and identity [25]. Learning in a community of practice thus involves negotiation of meaning which is a process of participation and reification. Von Krogh, Ichijo and Nonaka (2000) stress a similar complex understanding. They, however, talk about *knowledge creation* rather than learning. They define knowledge as *justified true belief, individual and social, tacit and explicit* [26, p.30]. As a consequence, knowledge creation cannot be managed, only enabled: “*Instil a knowledge vision, manage conversations, mobilize knowledge activists, create the right context and globalize local knowledge*” (*ibid.*). Within a team of designers, which perhaps includes users (practicians), it is reasonable to expect participants to bring different knowledge and thus different *justified true beliefs* to the process, which subsequently calls for a negotiation of meaning within the design team. In addition to this, one of the lessons from systems development is that it is important that beliefs *do get* challenged and subjected to both negotiations and test. Therefore the CoED method draw on methods and techniques for challenging and negotiating beliefs.

### 3.1.3 Facilitation of creative processes

This source of inspiration is of a more practical nature than systems development and learning theory. Card sorting and future workshops, which are both mentioned here, are, however, powerful ways of organising and facilitating a targeted negotiation of meaning within systems development projects.

Card sorting is a widely known technique for exploring differences and negotiating areas of agreement within systems development, and specifically within information architecture. This technique can help individuals explain to the designer how they think about a domain. With groups of card sorters the designer will be able to facilitate discussion and negotiation of priorities – for example by giving some values priority over others or sort the cards in ways that makes designers discuss from a certain pedagogical approach. In the case of value identification, the participants in the card sorting-process start off with a stack of cards with one value sentence of phrase printed on each card. Participants negotiate which cards to keep and which to dispose of. Through a series of steps, which are described later in this paper, a group is supposed to put forward a limited number of values all can agree on. The future workshop is another method with a slightly different aim. It leads a group of designer-practitioners through a collaborative process composed of three phases: Critique, fantasy, and realisation. It builds on three basic assumptions [27], [28].:

1. Personally experienced contradictions and problems in practice are drivers for solutions and change, hence the critique phase.
2. If suggestions for solutions are constrained by feasibility and sustainability concerns too early in the process, valuable ideas and design solutions will be lost, hence the fantasy phase, and
3. Reality poses constraints that must be taken into account, hence the realisation and distinction between fantasy and reality.

I'll not argue for one method over the other in the creative process, but I'll like to stress that it might be of importance to consider the aim of the design and what brings the designers most dialog, meaning and negotiation.

## 3.2 CoED phases and principles

The CoED-workshop methodology aims to support a collaborative design process with experts within domain, qualification level and subject, respectively. Emphasis is on bringing focus and structure to the early stages of the design process. It aims to develop design specifications and/or early prototypes within a few hours of work. The status and usability of early prototypes of course depends on several factors which we will discuss further in the paper. In overview, the methodology takes participants through three phases in the design process which:

- Focus the e-learning design process - leads to a clarification of the philosophical and educational values underpinning the design;

- Identify overarching values and design principles - assists designers in choosing the appropriate blend of technologies, learner- and teacher activities, and study-/learning materials; and
- Specify design - produces rapid prototypes using low tech materials and within a short period of time.

The CoED method facilitates the design process by following five principles and splitting the early design into three phases.

Principles - the CoED method:

1. Facilitates conversations about e-learning design
2. Structures conversations about e-learning design
3. Produces design specifications and/or actual designs rapidly
4. Involves e-learning experts, domain specialists and future users of the e-learning design
5. Involves at least two people in the design process

Following principle number four, the design process ideally involves learning experts, domain specialists and future users of the learning design. It's important to be aware, however, that this is not always the case, and not always possible either. By mapping the range and degrees of the different areas of knowledge involved in the design process, it becomes possible to predict a number of actions and procedures in the design process. From the experiences already gained the matrix below illustrate predictions of four possible outcomes and procedures following the CoED workshop.

	<b>Low degree of domain knowledge</b>	<b>High degree of domain knowledge</b>
<b>Low degree of pedagogical/didactical knowledge</b>	<b>Situation 1:</b> The CoED product should be reviewed and tested by domain specialists, future users and learning designers.	<b>Situation 2:</b> The CoED product should be reviewed by experienced learning designers.
<b>High degree of pedagogical/didactical knowledge</b>	<b>Situation 3:</b> The CoED product should be reviewed by domain experts and/or tested by domain experts and end users.	<b>Situation 4:</b> The CoED product can be implemented without further research or test.

Table 2: Matrix of dependencies and expected outcomes in the CoED method.

An important factor to bear in mind is the fact that the CoED method must always be adapted to the current application context, hence the method can lead to slightly different development processes. Differences in participant background and ambition will affect both the development process as any result that might develop. The method has been used within different projects e.g. in a local Danish project involving high school teachers and a European project in which participants came from universities, semi-public and private companies. Where the local project developed teaching and learning for secondary schools, the European project developed teaching and learning processes for different groups of adults in work. Last but not least, the approach has been used and developed in relation to an EU project on the design of courses to Enterprise Architecture education within both the private and public sectors and academia.<sup>1</sup>

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<sup>1</sup> More about the different projects at [www.ell.aau.dk](http://www.ell.aau.dk)



### 3.3 CoED as inspiration for workshop design

As mentioned in the earlier section above, the CoED method works by splitting the design process into three phases, and the method will be point of departure in the workshop design making the inspiration for the flow in the design of web 2.0 mediated learning.

During the last couple of years there has been a project implementing Moodle<sup>2</sup> as a Virtual Learning environment (VLE) at several educations at the Faculty of Social Science at Aalborg University (AAU), and the possibilities in using Moodle in different learning practices seems interesting. Moodle also represent some web 2.0 technologies like weblog and wiki technologies. Challenging the teachers in using the web 2.0 possibilities in Moodle combined with importing or using other web 2.0 technologies in their learning practice could be interesting. Therefore an optional design workshop is arranged for teachers interested in challenge own learning practice. The Point of departure will be inspired by the CoED method.

In the following I will describe the intentions within the three phases, and how I intend to use the method in a teachers-workshop at the Faculty of Social Science at AAU.

In *phase I* of the design process the idea is to focus the design activity in relation to the overall approach to and understanding of learning, domain, and technology. In the workshop I, as facilitator will invite different domain experts for presenting the participants to key issues in pedagogical design of e.g web 2.0 mediated learning. This is done to focus the attention on the philosophy of the design which concerns:

1. The understanding of learning (with ICT)
2. The understanding of the domain (learning practice), and
3. The understanding of PBL and web 2.0 technologies and the role they play in both the design and the learning process [19] together with the continua for web 2.0 mediated learning.

As mentioned the characteristics of a web 2.0 activity fit well with a learning approach based on PBL. Therefore the focus in this first phase related to the aim of designing for web 2.0 mediated learning should lead the participants to an understanding of PBL and web 2.0 for them to further exploit these in the actual design. The intention here will be to make a brush up of "The Aalborg Pedagogical Model" and PBL in general, as to focus on learning. Moreover a presentation of web 2.0 technologies and possibilities within activities both experiences but also hypothetical activities not yet tried out, researched and analysed.

In *phase II* the goal is to discuss and identify the overall values and principles to guide the design. One approach is iterations where the participants prioritized the pedagogical value cards into groups of: 1) the most important, 2) the important, 3) the less important, and 4) the unimportant. During the iterations of card sorting, it's of importance participants will have the opportunity to discuss the chosen teaching/learning values by reflecting on questions related to the four continua: *the learning process*, *the motivation*, *the infrastructure (e.g. the system)* and *the resources/content*. The continua will be presented in the first phase but not directly presented to the participants in this second phase, but they will be built into the design of the particular cards used. Hopefully through these discussions the participants will discover the consequences of the learning approaches, while at the same time making it possible to see what dimensions in relation to web 2.0 they needed to consider related to their own learning practice. Moreover, the phase will help the participants sort out contradicting cards. In this way answering the questions might help focus the process towards choosing the final learning values.

In *phase III* the focus is to develop a detailed learning design using the values and principles prioritized in phase II [19]. In this phase the participants are divided into two or more groups or design teams depended on the number of participants. For this phase there will be a facilitator asking critical questions supporting the group in formulating a design. It's important to focus on the chosen values and bear in mind the questions relating to the four dimensions [29]. To guide the dialogue about the more detailed design, participants will be working with a set of cards illustrating three factors relevant for pedagogical, technical and domain-related issues: *Resources*, *activities* and *infrastructure* [19]. A considerable proportion of these cards will represent the tensions, concepts and models we have identified in earlier project dealing with PBL and web 2.0 [29], [30] e.g. some could be named 'student

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<sup>2</sup> Moodle is a Modular Object-Oriented Dynamic Learning Environment ([www.moodle.org](http://www.moodle.org))

owns problem' or 'teacher owns solution'. Based on these descriptions, designers could work with transforming user practices and experience with domestic and recreational use patterns into new educational practices.

Some of the problems identified throughout other projects using CoED are the lack in testing the design and the sustainability of the results gained in the workshop. Therefore it is necessary supporting the teachers in the complexity from developmental mode to establishing a practical mode, which isn't build into the CoED method. I intend to extend the method to also deal with the process after the 'one-day' workshop by follow up on the design ideas developed during the workshop and then kick-off the modifications in the individual teaching practices. Regarding research I'll follow the process and make individual interviews with primarily teachers but also students to get both perspectives.

## 4 CONCLUSIONS

The intention of this paper has been to bring up a design model or method, supporting teachers in integrating web 2.0 in their learning practice. I have tried to illustrate and discuss important consideration in the design process. Integrating web 2.0 technologies (tools) and practices (activities) in a PBL approach makes good sense, as the main interpretations of web 2.0, highlighting more social, student centred, collaborative and production oriented pedagogical strategies, which align well with most interpretations of PBL. While the theoretical differences might be difficult for practitioners to make immediate sense of, they make quite a difference when it comes to practical design of courses build on a PBL approach, but also in deciding which web 2.0 technologies and practices to incorporate for a particular course.

Implementing Moodle as virtual learning environment has already entailed new learning practices to some teachers and there are already technologies in Moodle supporting web 2.0 activities. However the teachers don't use these possibilities, which I hope to challenge further by offering a workshop followed by individual kick-off's. It's important to support teachers in the design, development and implementation of these changes and modifications in their learning practice. Former research and experiences in e.g. using the CoED method has shown that a hurdle is to successfully communicate the results of the design workshop to relevant actors, and bring the design into a sustainable learning practice.

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